

# **Pesticide Risk Assessment for Pollinators**

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# Pesticide Risk Assessment for Pollinators

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*This book is dedicated to the memory of Dr. Peter Delorme of Health Canada's Pest Management Regulatory Agency. Dr. Delorme served as a member of the Steering Committee for the global SETAC Pellston Workshop on the Pesticide Risk Assessment for Pollinators, and is remembered for his contributions to this effort, and for his long service to protecting the environment.*

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## Pellston Workshop Series

The workshop from which this book resulted, Potential Risks of Plant Protection Products to Pollinators, held in Pensacola Beach, Florida, USA, January 16–22, 2011, was part of the successful SETAC Pellston Workshop Series. Since 1977, Pellston Workshops have brought scientists together to evaluate current and prospective environmental issues. Each workshop has focused on a relevant environmental topic, and the proceedings of each have been published as peer-reviewed or informal reports. These documents have been widely distributed and are valued by environmental scientists, engineers, regulators, and managers for their technical basis and their comprehensive, state-of-the-science reviews. The workshops in the Pellston series are as follows:

- Estimating the Hazard of Chemical Substances to Aquatic Life. Pellston, Michigan, June 13–17, 1977. Published by the American Society for Testing and Materials, STP 657, 1978.
- Analyzing the Hazard Evaluation Process. Waterville Valley, New Hampshire, August 14–18, 1978. Published by the American Fisheries Society, 1979.
- Biotransformation and Fate of Chemicals in the Aquatic Environment. Pellston, Michigan, August 14–18, 1979. Published by the American Society of Microbiology, 1980.
- Modeling the Fate of Chemicals in the Aquatic Environment. Pellston, Michigan, August 16–21, 1981. Published by Ann Arbor Science, 1982.
- Environmental Hazard Assessment of Effluents. Cody, Wyoming, August 23–27, 1982. Published as a SETAC Special Publication by Pergamon Press, 1985.
- Fate and Effects of Sediment-Bound in Aquatic Systems. Florissant, Colorado, August 11–18, 1984. Published as a SETAC Special Publication by Pergamon Press, 1987.
- Research Priorities in Environmental Risk Assessment. Breckenridge, Colorado, August 16–21, 1987. Published by SETAC, 1987.
- Biomarkers: Biochemical, Physiological, and Histological Markers of Anthropogenic Stress. Keystone, Colorado, July 23–28, 1989. Published as a SETAC Special Publication by Lewis Publishers, 1992.
- Population Ecology and Wildlife Toxicology of Agricultural Pesticide Use: A Modeling Initiative for Avian Species. Kiawah Island, South Carolina, July 22–27, 1990. Published as a SETAC Special Publication by Lewis Publishers, 1994.
- A Technical Framework for [Product] Life-Cycle Assessments. Smuggler's Notch, Vermont, August 18–23, 1990. Published by SETAC, January 1991; 2nd printing September 1991; 3rd printing March 1994.
- Aquatic Microcosms for Ecological Assessment of Pesticides. Wintergreen, Virginia, October 7–11, 1991. Published by SETAC, 1992.
- A Conceptual Framework for Life-Cycle Assessment Impact Assessment. Sandestin, Florida, February 1–6, 1992. Published by SETAC, 1993.
- A Mechanistic Understanding of Bioavailability: Physical–Chemical Interactions. Pellston, Michigan, August 17–22, 1992. Published as a SETAC Special Publication by Lewis Publishers, 1994.
- Life-Cycle Assessment Data Quality Workshop. Wintergreen, Virginia, October 4–9, 1992. Published by SETAC, 1994.
- Avian Radio Telemetry in Support of Pesticide Field Studies. Pacific Grove, California, January 5–8, 1993. Published by SETAC, 1998.

- Sustainability-Based Environmental Management. Pellston, Michigan, August 25–31, 1993. Co-sponsored by the Ecological Society of America. Published by SETAC, 1998.
- Ecotoxicological Risk Assessment for Chlorinated Organic Chemicals. Alliston, Ontario, Canada, July 25–29, 1994. Published by SETAC, 1998.
- Application of Life-Cycle Assessment to Public Policy. Wintergreen, Virginia, August 14–19, 1994. Published by SETAC, 1997.
- Ecological Risk Assessment Decision Support System. Pellston, Michigan, August 23–28, 1994. Published by SETAC, 1998.
- Avian Toxicity Testing. Pensacola, Florida, December 4–7, 1994. Co-sponsored and published by Organisation for Economic Co-operation and Development (OECD), 1996.
- Chemical Ranking and Scoring (CRS): Guidelines for Developing and Implementing Tools for Relative Chemical Assessments. Sandestin, Florida, February 12–16, 1995. Published by SETAC, 1997.
- Ecological Risk Assessment of Contaminated Sediments. Pacific Grove, California, April 23–28, 1995. Published by SETAC, 1997.
- Ecotoxicology and Risk Assessment for Wetlands. Fairmont, Montana, 30 July–3 August 1995. Published by SETAC, 1999.
- Uncertainty in Ecological Risk Assessment. Pellston, Michigan, August 23–28, 1995. Published by SETAC, 1998.
- Whole-Effluent Toxicity Testing: An Evaluation of Methods and Prediction of Receiving System Impacts. Pellston, Michigan, September 16–21, 1995. Published by SETAC, 1996.
- Reproductive and Developmental Effects of Contaminants in Oviparous Vertebrates. Fairmont, Montana, July 13–18, 1997. Published by SETAC, 1999.
- Multiple Stressors in Ecological Risk Assessment. Pellston, Michigan, September 13–18, 1997. Published by SETAC, 1999.
- Re-evaluation of the State of the Science for Water Quality Criteria Development. Fairmont, Montana, June 25–30, 1998. Published by SETAC, 2003.
- Criteria for Persistence and Long-Range Transport of Chemicals in the Environment. Fairmont Hot Springs, British Columbia, Canada, July 14–19, 1998. Published by SETAC, 2000.
- Assessing Contaminated Soils: From Soil-Contaminant Interactions to Ecosystem Management. Pellston, Michigan, September 23–27, 1998. Published by SETAC, 2003.
- Endocrine Disruption in Invertebrates: Endocrinology, Testing, and Assessment (EDIETA). Amsterdam, The Netherlands, December 12–15, 1998. Published by SETAC, 1999.
- Assessing the Effects of Complex Stressors in Ecosystems. Pellston, Michigan, September 11–16, 1999. Published by SETAC, 2001.
- Environmental–Human Health Interconnections. Snowbird, Utah, June 10–15, 2000. Published by SETAC, 2002.
- Ecological Assessment of Aquatic Resources: Application, Implementation, and Communication. Pellston, Michigan, September 16–21, 2000. Published by SETAC, 2004.
- Toxicity Identification Evaluation/Toxicity Reduction Evaluation: What Works and What Doesn't. Pensacola, Florida, June 23–27, 2001. Proceedings published by SETAC in 2005.
- The Global Decline of Amphibian Populations: An Integrated Analysis of Multiple Stressors Effects. Wingspread, Racine, Wisconsin, August 18–23, 2001. Published by SETAC, 2003.
- Methods of Uncertainty Analysis for Pesticide Risks. Pensacola, Florida, 24 February–1 March 2002.
- The Role of Dietary Exposure in the Evaluation of Risk of Metals to Aquatic Organisms. Fairmont Hot Springs, British Columbia, Canada, 27 July–1 August 2002. Published by SETAC, 2005.

- Use of Sediment Quality Guidelines (SQGs) and Related Tools for the Assessment of Contaminated Sediments. Fairmont Hot Springs, Montana, August 17–22, 2002. Published by SETAC, 2005.
- Science for Assessment of the Impacts of Human Pharmaceuticals on Aquatic Ecosystem. Snowbird, Utah, June 3–8, 2003. Published by SETAC, 2005.
- Population-Level Ecological Risk Assessment. Roskilde, Denmark, August 23–27, 2003. Published by SETAC and CRC Press, 2007.
- Valuation of Ecological Resources: Integration of Ecological Risk Assessment and Socio-Economics to Support Environmental Decisions. Pensacola, Florida, October 4–9, 2003. Published by SETAC and CRC Press, 2007.
- Emerging Molecular and Computational Approaches for Cross-Species Extrapolations. Portland, Oregon, July 18–22, 2004. Published by SETAC and CRC Press, 2006.
- Veterinary Medicines in the Environment. Pensacola, Florida, February 12–16, 2006. Published by SETAC and CRC Press, 2008.
- Tissue Residue Approach for Toxicity Assessment: Invertebrates and Fish. Leavenworth, Washington, June 7–10, 2007. Published in SETAC Journal *Integrated Environmental Assessment and Management* (IEAM), 2011.
- Science-Based Guidance and Framework for the Evaluation and Identification of PBTs and POPs. Pensacola Beach, Florida, 27 January–1 February 2008.
- The Nexus between Ecological Risk Assessment (ERA) and Natural Resource Damage Assessment (NRDA). Fairmont, Montana, January 28–31, 2008. Published in SETAC Journal *Integrated Environmental Assessment and Management* (IEAM), 2009.
- Ecological Assessment of Selenium in the Aquatic Environment. Pensacola Beach, Florida, February 22–27, 2009. Published by SETAC and CRC Press, 2010.
- A Vision and Strategy for Predictive Ecotoxicology in the 21st Century: Defining Adverse Outcome Pathways Associated with Ecological Risk. Forest Grove, Oregon, April 19–23, 2009. Published in SETAC Journal *Environmental Toxicology and Chemistry* (ET&C), 2011.
- Problem Formulation for Ecological Risk Assessments. Pensacola Beach, Florida, April 18–24, 2010.
- Potential Risks of Plant Protection Products to Pollinators. Pensacola Beach, Florida, January 16–22, 2011.
- Life Cycle Assessment Database Global Guidance. Kanagawa, Japan, 30 January–4 February 2011. Published by the UNEP/SETAC Life Cycle Initiative, 2011.
- Influence of Global Climate Change on the Scientific Foundation and Application of Environmental Toxicology and Chemistry. Racine, Wisconsin, July 16–21, 2011. Published in ET&C, 2012.
- Guidance on Bioavailability/Bioaccessibility Measurements Using Passive Sampling Devices and Partitioning-Based Approaches for Management of Contaminated Sediments. Costa Mesa, California, November 7–9, 2012. To be published in ET&C and IEAM, 2013.

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